



Comments to Figure 4.

- 1 Incised drainage across eroded, back-facing scarp(?) or fold structure. No well-defined fault features.
- 2 "Faceted" spurs are not sharply defined, and have been eroded.
- 3 Truncated spurs 0.5 to 1.0 meter high in Pleistocene conglomerate (orange soil); scarps very rounded with very low scarp angle; no evidence of active faulting. (f) 2/7/86
- 4 Alignment of saddles; fault not verified.
- 5 Drainages broadly incised across west-facing scarp(?) in Pleistocene alluvium.
- 6 No evidence of faulting in Holocene alluvium or alluvial fans.
- 7 Eroded scarp(?) and aligned notches.
- 8 Linear edge of channel.
- 9 Incised drainages in alluvial fan are not offset.
- 10 Broad trough and saddles; these erosional features are probably located along an old fault trace.
- 11 Soil section exposed in dirt road by 45 cm (18") of deflation; surface is pink to tan; subsurface material is light brown when moist; very slight clay coating on grains, but grains are not cohesive. (f) 2/4/86
- 12 Shears in bedrock dip 20° SW.
- 13 Low shutter ridge(?) with left-lateral deflected drainage. (f) 2/4/86
- 14 Truncated older alluvium; eroded scarp(?) approximately 1 meter high, with scarp angle of 5°-10°. (f) 2/4/86
- 15 Scarp in older alluvium, approximately 2 meters high. (f) 2/4/86
- 16 Alignment of truncated alluvial fans; scarps are 1 to 4 meters high. Some widely-spaced (youngest?) fans do not appear to be truncated. All surficial material along fault is broken bedrock; desert pavement covers soil that is light brown at depth. (f) 2/4/86
- 17 Eroded, northeast-facing bedrock scarp, up to 4 meters high. (f) 2/3/86
- 18 No evidence of faulting in young alluvium.
- 19 Possible scarp in older (Pleistocene) alluvial fan.
- 20 Poorly defined to moderately well-defined on air photos. Eroded, linear scarp lacks evidence of recent faulting.
- 21 Linear break-in-slope between alluvial fan and bedrock; no evidence of faulting at either end of break-in-slope.
- 22 Shutter ridge covered with shattered rock and coarse colluvium; Holocene alluvial fan abutting the northeast side of the shutter ridge is composed of boulder gravel. No evidence of recent faulting was seen at base of the ridge, but fault-related geomorphic features may be concealed by the young alluvium.
- 23 Northwest-trending, 100 meters-wide shear zone is exposed in the railroad cut. Most shears are concentrated in a zone 40-50 meters wide, and trend N. 45° W. Exposed material is alluvium derived from Black Mountain limestone deposits to the northeast. Shears are calciche-filled, with crude horizontal slickensides in the calciche. Some shears are open, and most do not extend to the top of the lower level of the road cut. The ground surface is latest Pleistocene-early Holocene (B.W. Hart, p.c.), with no evidence of recent surface faulting. (f) 1/15/86
- 24 Slight calciche deposits on clasts 20cm-40cm beneath surface of light brown alluvium; alluvium is probably Holocene in age. (f) 2/4/86
- 25 Older (Pleistocene) alluvium faulted against younger (latest Pleistocene?) alluvium.
- 26 Alluvial fan appears to be of latest Holocene age.
- 27 Scarps(?) from air photos; features are 1-2 meters high, and are probably erosional features in older alluvial fan surface (reddish soil). (f) 2/4/86
- 28 Eroded, linear ridge in very light-reddish-brown alluvium; may be a fault scarp. (f) 2/4/86
- 29 Possible northeast-facing scarp in bedrock, with estimated height of 6-8 meters. (f) 2/4/86
- 30 Truncated toe of alluvial fan, possibly erosional. Gentle, 2 meter-high rise of ground surface; surficial material is reddish, very-fine-grained silty sand. (f) 2/4/86
- 31 Toe of fan; may be erosional.
- 32 Possible scarp in eroded, jointed bedrock. (f) 2/6/86
- 33 Linear trough in bedrock.
- 34 Channel eroded into zone of soft, clayey decomposed granite. (f) 2/5/86
- 35 No scarp; low mound (1.5 m high) of caliche pebbles and cobbles. (f) 2/5/86
- 36 Sinuous channel in bedrock.
- 37 Alignment of scarp(?) and tonals on 1945 air photos.
- 38 Holocene alluvium; soil not developed; small drainage terminates abruptly due to sapping.
- 39 Linear northeast-facing scarp is degraded due to lateral erosion and large-scale sapping of southwest bank.
- 40 No air photo evidence of faulting in young alluvium. Surface material appears to be probably latest Holocene; no soil development noted. (f) 2/5/86
- 41 Projected trace of fault in gravel pit is concealed by overburden piles. (f) 2/5/86
- 42 Alignment of shallow saddles and linear drainages. (f) 2/6/86
- 43 Small borrow pit in colluvium. (f) 2/6/86
- 44 Alluvium is probably late Holocene age. (f) 2/6/86
- 45 Truncated Pleistocene fan deposits. (f) 2/6/86
- 46 Older alluvium is slightly cemented. (f) 2/6/86
- 47 Box S Springs - Scarp is approximately 11 meters (35 feet) high, and is eroded by sapping. Conglomerate is very hard and is well-cemented by calciche. (f) 2/7/86
- 48 Possible northeast-facing scarp in bedrock, with estimated height of 6-8 meters. (f) 2/4/86
- 49 Vertical slickensides in thinly bedded limestone. (f) 2/5/86
- 50 Horizontal slickensides along fault plane in vein quartz. (f) 2/5/86

Base from U.S. Geological Survey  
Helendale, 1956; Apple Valley North, Fairview  
Valley, Turtle Valley, 1970; Big Bear City,  
Cougar Butte, Fifteen Mile Valley, Lucerne  
Valley, 1971; Astley Rancho, Wild Crossing, 1973

# HELENDALE FAULT

Figure 4 to FEA-176. Air photo interpretations and field observations of young-looking fault features along the Helendale fault. Base map, and fault traces and annotations shown in black are from Morton and others (1980, sheet 1). Fault traces shown in green, and annotations bordered in green are by Manson, with assistance by Hart and Bryant (this report). Additional traces near Cougar Butte, in orange or red, are from Hollenbaugh (1968) or Sadler (1982), respectively.

## MAP EXPLANATION

- Fault: Solid line indicates accurately located; dashed line, approximately located; dotted where concealed; grayed where uncertain; hatchures indicate direction scarp faces.
- X Strike of vertical bedding
- (f) 2/4/86 Field observation, with date of observation.
- Geomorphic features indicative of fault location and/or reactivity (based mainly on air photo interpretations by Manson)
- r tonal
- dd deflected drainage (right-lateral sense)
- ld linear drainage
- 3 Locality described in table.
- ✓ Verified feature of Morton and others (1980).
- s saddle or notch
- shb sidehill bench

